MULTIMEDIA UNIVERSITY

STUDENT ID NO

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TABLE NO:

# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

**TRIMESTER 2, 2016/2017**

## TCE1111 – DIGITAL SYSTEMS

(All Sections /Groups)

28 FEBRUARY 2017
2.30 p.m. - 4.30 p.m.
( 2 Hours )

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**INSTRUCTIONS TO STUDENTS**

1. This Question paper consists of 13 pages including cover page with **5** Questions only.

2. Answer **ALL 5** questions. Each question carries 12 marks and the distribution of the marks for each subdivision is given. Maximum marks allocated are 60 marks.

3. Please **write all your answers in the Question Paper itself** in the space provided.

***QUESTION 1:***

a. Convert the Binary number $(101101)_2$ into the following number systems:

i. Decimal
ii. Octal
iii. Hexadecimal
iv. Gray Code

**(4 ×1=4 marks)**

b. Perform the following binary arithmetic operation:

i. 1101 + 1011
ii. 1010 – 0111

**(2 x 1 = 2 marks)**

*Continued...*

c. i. What is an 'Overflow condition' during addition of signed numbers?
ii. When does an 'Overflow condition' occur?

**(2 marks)**

d. Perform the binary addition using 8 bit **2's complement** form for the following decimal numbers:

i. 33 and 15
ii. - 46 and 25

**(2x 2=4 marks)**

*Continued...*

***QUESTION 2:***

a. Simplify the following expression using Boolean algebra:

$$A\bar{B} + A\bar{B}C + A\bar{B}CD + A\bar{B}CDE$$

**(2 marks)**

b. For the Boolean function $F = A + \bar{C}D + AC\bar{D} + \bar{A}BC\bar{D}$ :

i. Obtain the truth table for F **(4 marks)**

ii. Use Karnaugh Map (K map) to simplify F. **(3 marks)**

iii. Draw the logic diagram for the simplified function F as in (ii) above. **(3 marks)**

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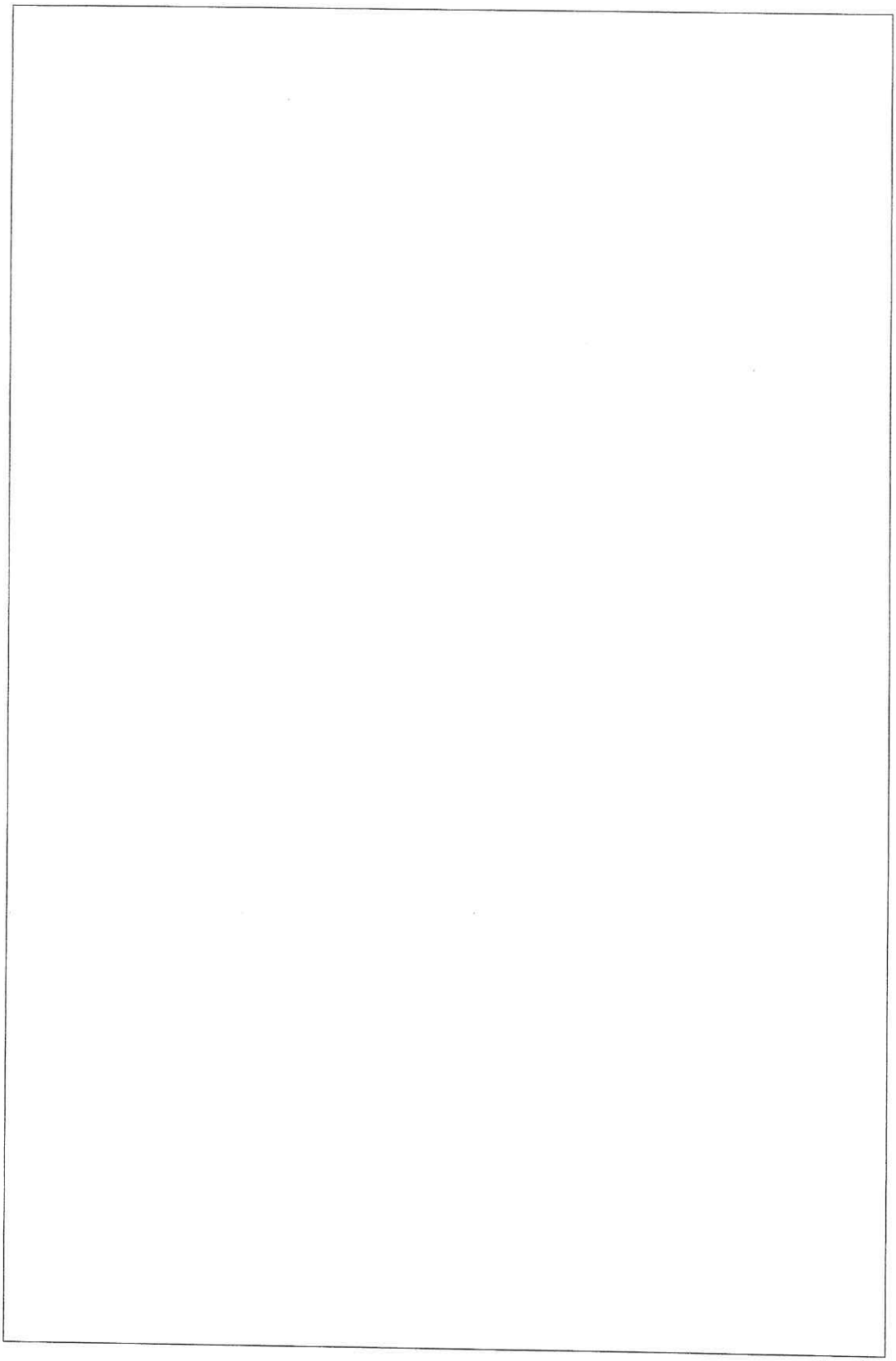

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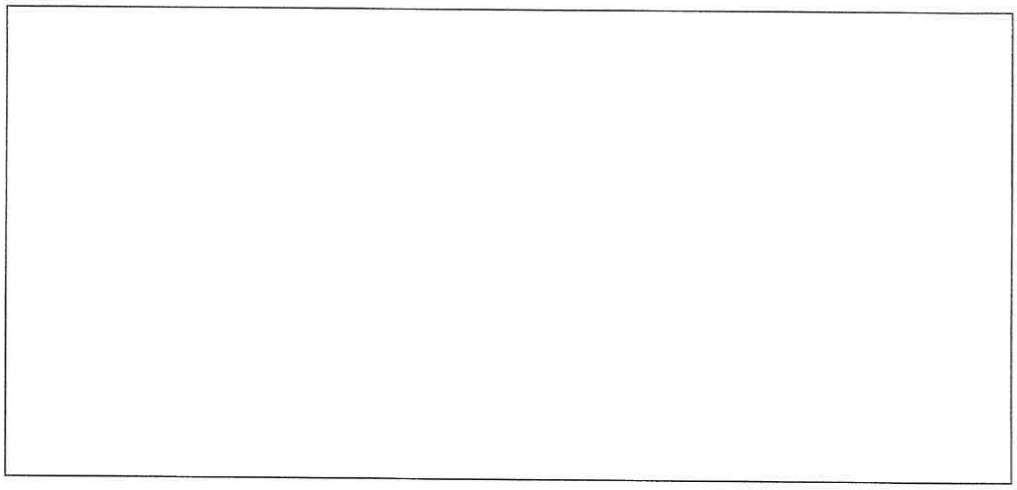


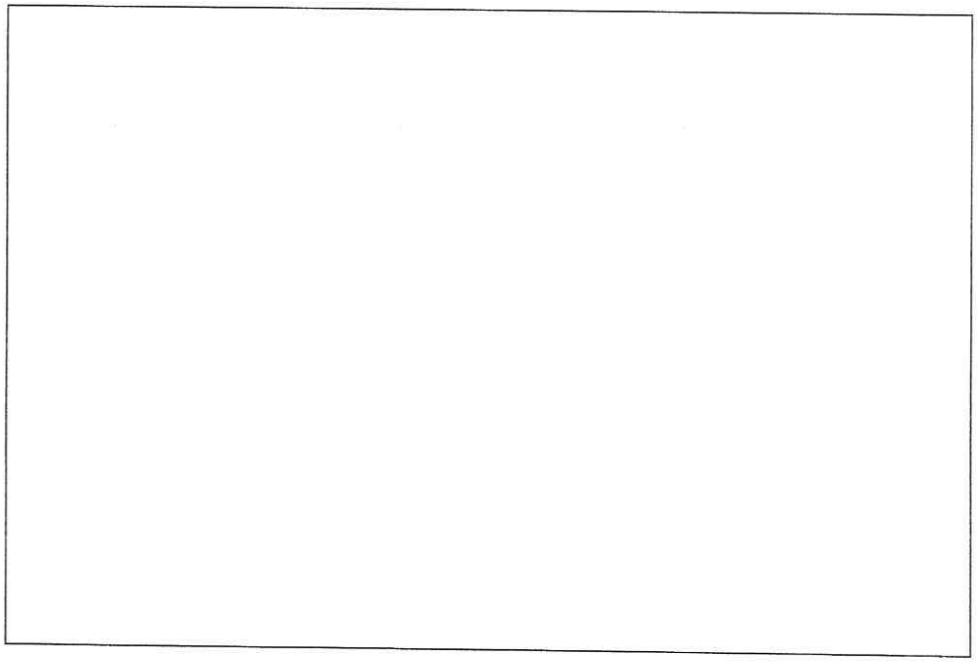
***QUESTION 3:***

a. For the input combinations 010, 100, 001, 011, a HIGH output will be presented in decoding. For other input combinations, the outputs are LOW. Implement the circuit for the above with a suitable decoder and necessary logic gates.

i. Write down the truth table **(2 marks)**

ii. Expression for the output function **(1 mark)**

iii. Draw the logic diagram of the implemented decoder **(2 marks)**



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b. Implement the following Boolean function with a 8x1multiplexer:

$F(A, B, C, D) = \Sigma\, m\,(1,3,4,11,12,13,14,15)$

i. Write down the truth table with the output function **(4 marks)**

ii. Draw the multiplexer implementation **(3 mark)**

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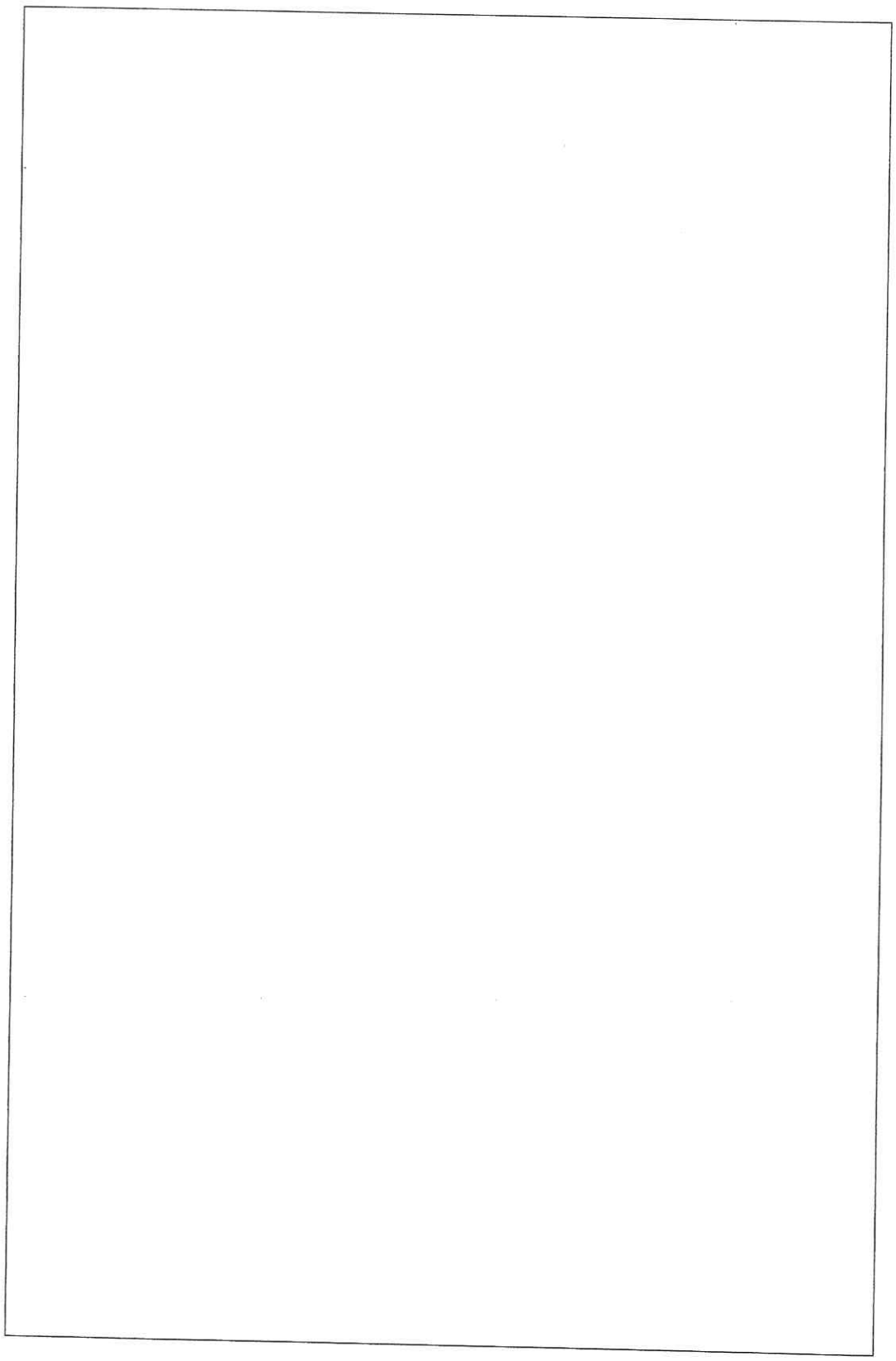

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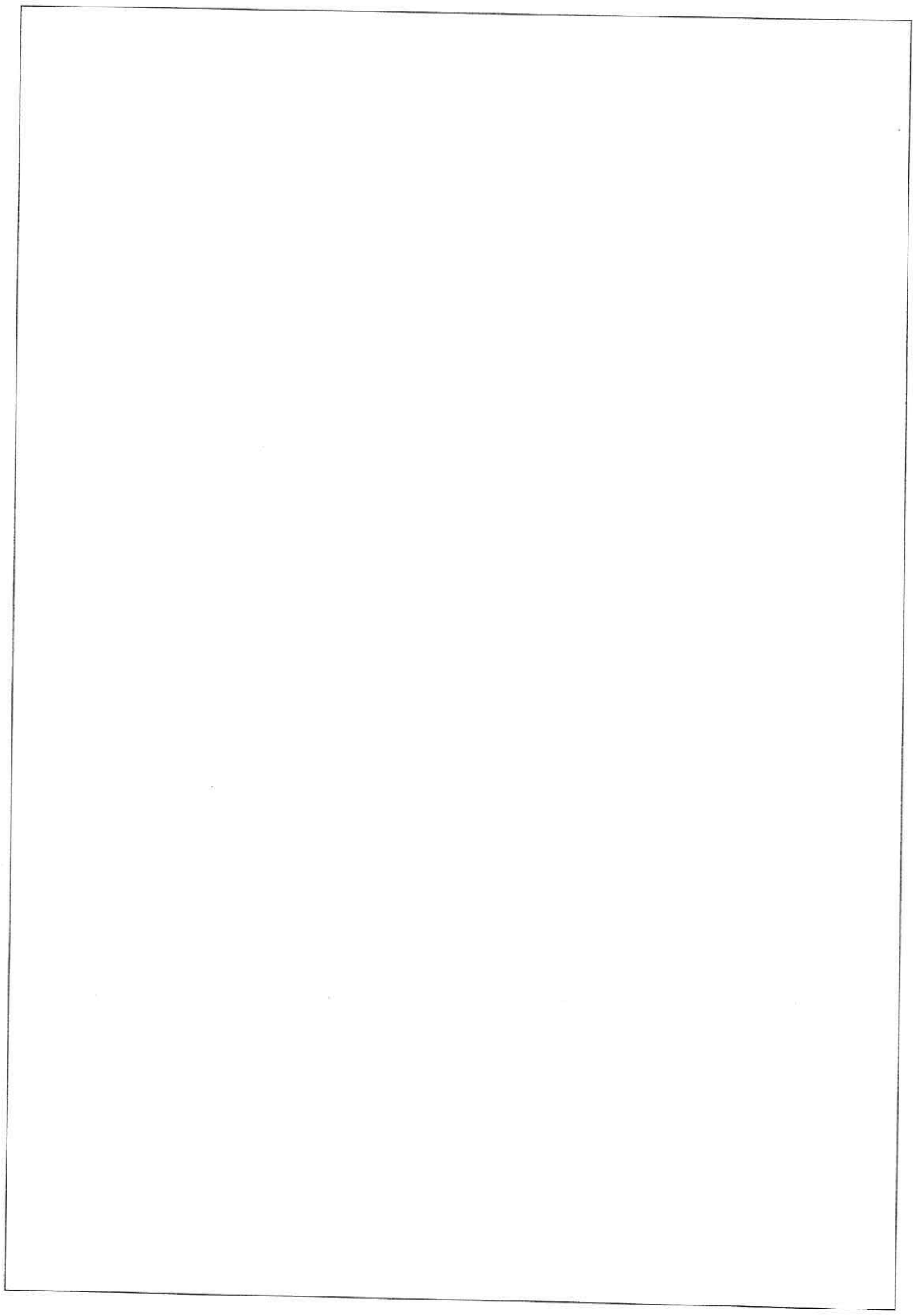

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***QUESTION 4:***

a. A synchronous counter has two negative-edged triggered D flip-flops and three inputs X, Y and Z. Design the counter based on the two conditions listed below:
   - If Z is 0, X and Y will count up based on the present state of X and Y.
   - If Z is 1, X and Y will count down based on the present state of X and Y.

   i. Complete the excitation table. **(4 marks)**

   ii. Simplify $D_X$ and $D_Y$ using K-maps. **(2 marks)**

   iii. Draw the synchronous counter. **(3 marks)**

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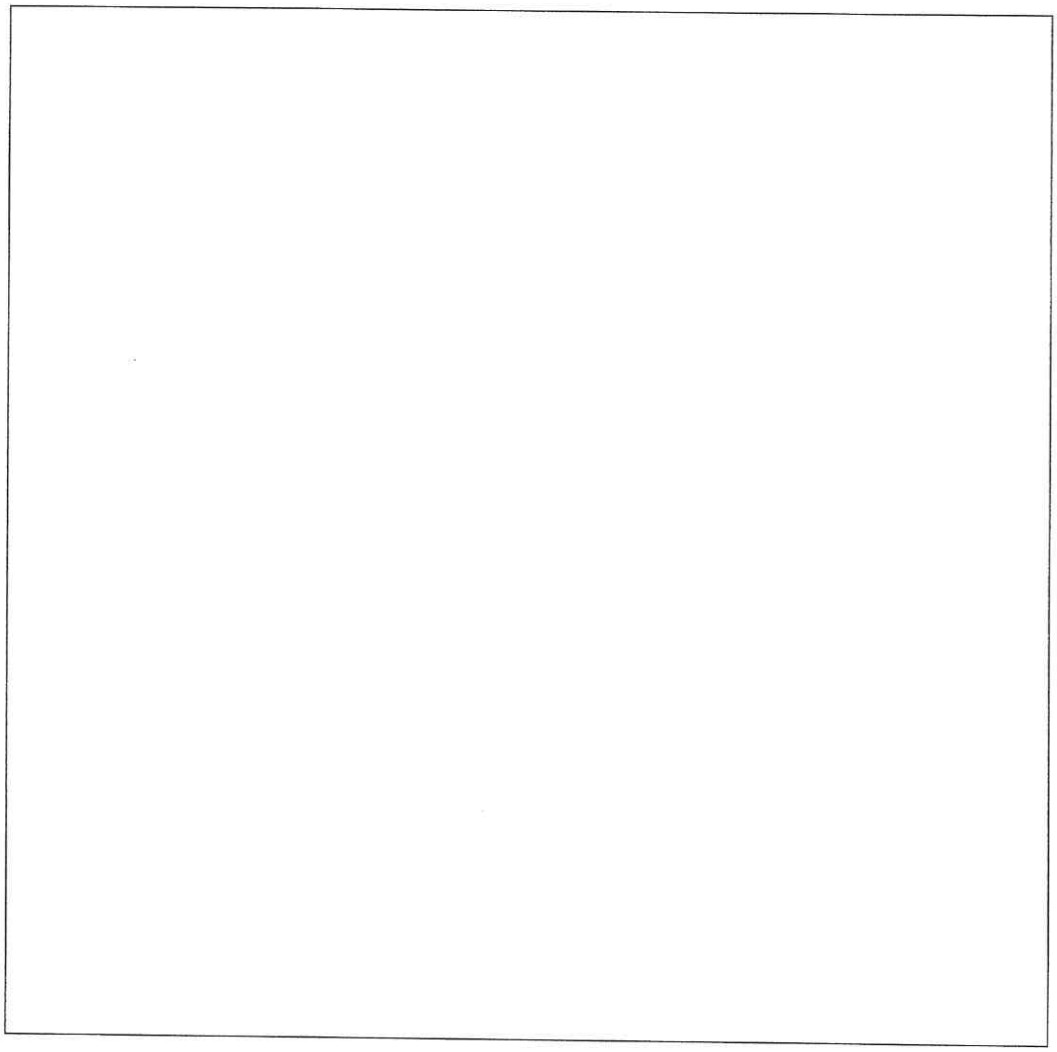
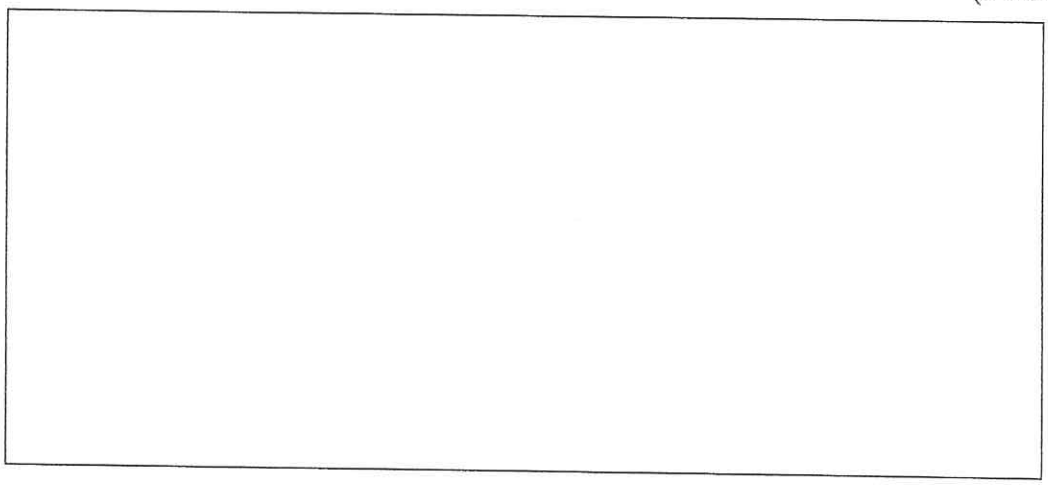


b. Draw a 2-bit binary ripple DOWN counter using positive-edge triggered JK flip flops.

**(3 marks)**



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## *QUESTION 5*

a. What is quantization? How does it help in the process of an analog signal being converted to a digital signal?

**(3 marks)**

b. Define the following terms:
   (i) Cache Memory
   (ii) Address Bus

**(3 marks)**

*Continued...*

c. How is a SRAM different from a DRAM?

**(3 marks)**

d. Explain with an example how the Successive Approximation ADC works.

**(3 marks)**

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